PALEONTOLOGY AND GEOLOGY OF THE BADWATER CREEK AREA, CENTRAL WYOMING

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Part 2. The Badwater Multituberculate

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This is the second in a series of papers concerned in part with the Badwater local fauna, of late Eocene age, from the Hendry Ranch Member of the Tepee Trail Formation of Natrona County, Wyoming. The author would like to thank Drs. Craig Black and Mary R. Dawson of the Carnegie Museum (CM) and Peter Robinson of the University of Colorado Museum (UCM) for the loan of specimens and for the invitation to describe this species. The author would also like to thank Dr. Malcolm C. McKenna and Dr. Black for the opportunity, during the summer of 1965, to observe central Wyoming's early Tertiary mammal localities, including the Badwater area. Studies of Cretaceous and Paleocene multituberculates, which supply the background for this investigation, have been supported by NSF grant GB-2213. The general late Eocene studies which led to the recovery of material described here were supported by NSF grants GB-1266 and GB-4089 to Drs. Black and Dawson. Support for publication was received from the Gulf Oil Corporation and the University of Minnesota.

INTRODUCTION

The discovery of an ectypodont multituberculate from the Badwater late Eocene (Robinson, *et al.*, 1964) unexpectedly extended the range for a subclass thought to have become extinct in the early Eocene (Jepsen, 1930, 1949). However, considering the variety of multituberculates in the early Eocene Four Mile fauna (McKenna, 1960) and in the Graybullian of the Bighorn Basin (Van Houten, 1945), some range extension might have been anticipated. The question now arises whether this is indeed the latest multituberculate. In view of the extensive studies of Chadronian micromammals in Montana, Wyoming, and South Dakota, I think it unlikely that any multituberculate survived

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in those areas at that time. However this is the only adequately surveyed area of this age in the world and the possibility cannot be excluded that multituberculates might have survived elsewhere in post-Uintan time.

SYSTEMATIC DESCRIPTION

Family ECTYPODONTIDAE[1]

The family Ectypodontidae (Sloan and Van Valen, 1965) consists of the genera *Cimexomys* Sloan and Van Valen, 1965; *Mesodma* Jepsen, 1940; *Mimetodon* Jepsen, 1940; *Ectypodus* Matthew and Granger, 1921; *Neoplagiaulax* Lemoine, 1882; *Parectypodus* Jepsen, 1930, and three unpublished middle Paleocene genera. Differential diagnoses of *Ectypodus* and *Neoplagiaulax* are included in my completed manuscript on Puercan multituberculates from the San Juan Basin. The manuscript is part of a larger paper on Puercan mammals.

Genus *Parectypodus* Jepsen, 1930

This genus has had a checkered history. Jepsen (1930) proposed it for a pair of new species from the Graybullian of the Bighorn Basin, *P. simpsoni* and *P. tardus*. In 1940, Jepsen provisionally placed it in the synonymy of *Ectypodus* following a suggestion by Simpson (1937). However, the type of *Parectypodus, P. simpsoni,* is not congeneric with *P. tardus,* which is referable to *Ectypodus. Parectypodus* is a valid genus that may be defined as follows: Ectypodontidae in which the height of the first serration above the anterior enamel base of P_4 is more than 50 per cent of the standard length of the tooth; the labial height of enamel at the anterior root of P_4 is approximately the same or greater in length than the standard length. The posterior angle between the plane of occlusion of the first molars and the anterior face of P_4 is a right or acute angle, usually the latter. The third or fourth serration of P_4 is highest above the base line for standard length. Known values for the ratio of length of P_4 to length of M_1 are high for ectypodontids (1.8 to 2.0). Advanced species lack P_3 as do advanced species of some other ectypodontid genera. The length of P^4 is about 80 to 85 per cent of the length of P_4 with cusp formulas 2-5:7-9. More external cusps occur in advanced species. The posterior slope of P^4 is short, steep, and slightly concave, the anterior slope convex, the antepenultimate cusp usually highest, and posterior basal cuspule usually absent.

[1] The spelling of this name is here corrected to agree with the derivation of the name *Ectypodus*.

Parectypodus lovei[2], new species
Figures 1 - 6, Table 1

HOLOTYPE: CM 15126, slightly worn right M_1.

HYPODIGM: M_1, CM 15129, CM 16982, CM 16983, and UCM 28359; posterior portions of P_4, CM 15053, CM 15629, CM 16980, CM 16984, and UCM 28358; M^1, CM 15084, CM 15085, CM 15133, CM 16981, UCM 25681, UCM 27076, UCM 27096, and UCM 28360; M^2, CM 15054, CM 15086, UCM 25255, and UCM 27094.

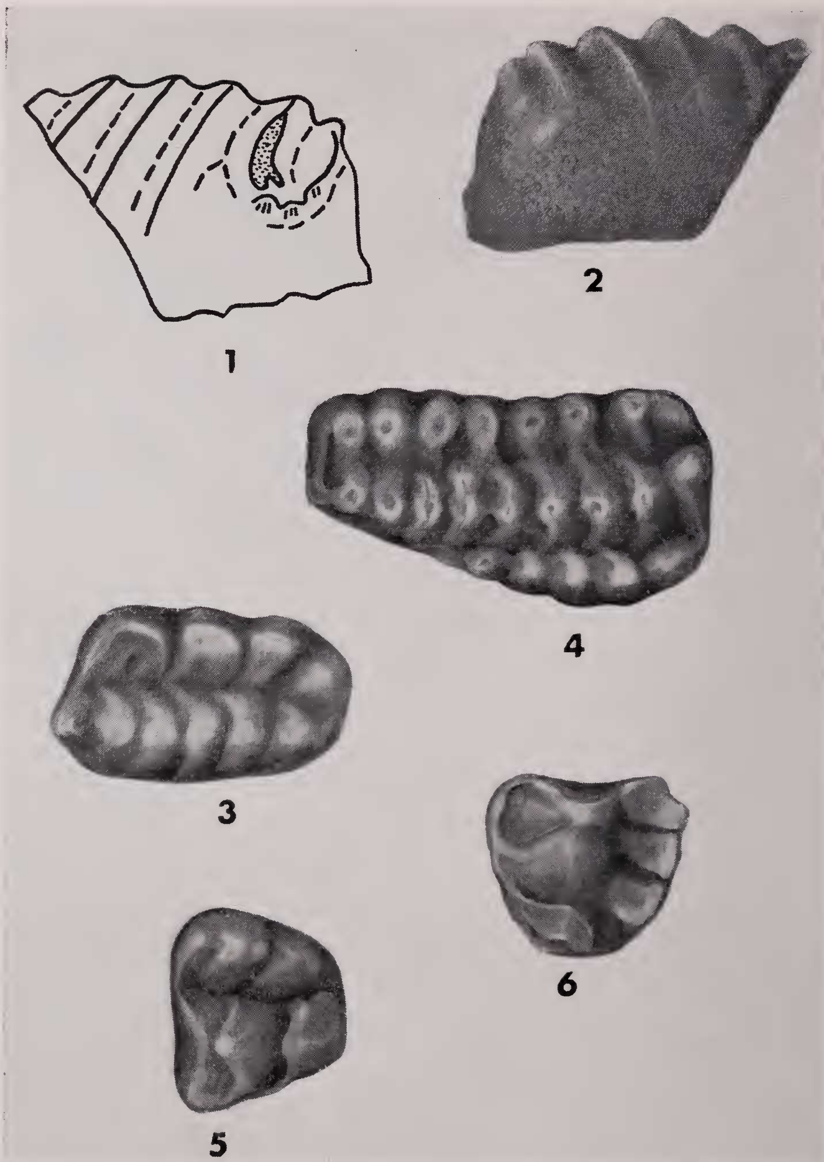
GEOLOGIC AGE AND LOCALITY: Uintan, late Eocene; Hendry Ranch Member, Tepee Trail Formation; locality 5 (Tourtelot, 1957) SW¼SW¼sec. 13, T. 39 N., R. 89 W., and 5A, NW¼sec. 24, T. 39 N., R. 89 W., Natrona County, Wyoming.

DIAGNOSIS: Small, size near that of *Parectypodus sinclairi.* Length: width, M_1, 1.6:0.9 mm., cusp formula 6:4. Length: width, M^1, 2.15:1.1 mm., cusp formula 8:10:6. Length: width, M^2, 0.95:1.0 mm., cusp formula 1:3:3. Estimated ratio, length P_4 to length M_1, 2.1.

DESCRIPTION AND DISCUSSION: Since no complete specimens of P_4 and none of P^4 are known for *Parectypodus lovei,* assignment of this new species might be questioned. The five partial specimens of P_4 are essentially all half teeth with the break occurring at the midpoint, just posterior to the large labial enamel expansion sheathing the anterior root. This is the usual place for a break in P_4. The partial P_4 specimens are slightly longer than the complete M_1 and the estimated P_4/M_1 ratio is 2.1. Of known ectypodontids, only *Neoplagiaulax macrotomeus* and the species of *Parectypodus* have the corresponding ratio near this value. In addition, the proportions of relative height of the posterior halves of P_4 are those of *Parectypodus* and so is the shape of the postero-labial cuspule and the associated minor sculpture (figs. 1,2). On the basis of the spacing of serrations, I would estimate the total number of serrations as 12±1; which is reasonable for a small ectypodontid.

M_1 is represented by five specimens in varying stages of wear. The length to width ratio is 1.7. This is rather low for an advanced ectypodontid and in fact no other post-Campanian ectypodontid I know has a ratio quite this low. It resembles University of California Museum of Paleontology (UCMP) 44009 from the Four Mile Fauna (McKenna, 1960, fig. 13c) rather closely. The cusp formula is 6:4 or 5, with 4 being the usual number of cusps in the internal row (fig. 3). CM 16983 has an incipiently bifid posterior internal cusp, and in CM 15129 this cusp has split. All cusps are crescentic. In comparison to the other internal cusps, the antero-internal cusp is displaced toward the midline of the tooth.

[2] For Dr. J. D. Love of the United States Geological Survey, whose studies of early Tertiary stratigraphy of Wyoming have greatly benefited vertebrate paleontology.



Figs. 1-6. Teeth of *Parectypodus lovei* x25. Fig. 1. CM 15053, fragmentary left P_4, labial view. Solid lines, outline or crest; stippled area, wear facet; dashed lines, troughs or centerline of depression. Fig. 2, CM 15053, fragmentary left P_4, lingual view. Fig. 3. CM 15126, right M_1, type specimen. Fig. 4. UCM 25681, left M^1. Fig. 5. CM 15086, right M^2. Fig. 6. CM 15054, worn right M^2.

No specimens of M_2 or of upper premolars have been recovered.

M^1 is represented by eight specimens, only one of which (UCM 25681, fig. 4; also figured in Robinson, *et al.*, 1964) is complete enough to provide length measurements or complete cusp formulas. Two other specimens are sufficiently complete to count the cusps on the internal row. The cusp formula of *P. lovei* is 8:10:5 or 6, which is about as close to the formula of *Parectypodus laytoni* (9:9:5) as to anything else. *P. lovei* and *P. laytoni* are the only species of *Parectypodus* in which this formula is known. The cusps of the middle row are significantly larger than the cusps of the other rows and have strongly crescentic lateral crests directed forward. The cusps in the posterior half of the external row have two medially directed crests each. The tooth is obliquely curved in the occlusal plane.

Four examples of M^2 are at hand. All are somewhat worn and have cusp formulas of 1:3:3 (figs. 5, 6). The external cusp is a swelling on a crest extending laterally from the external wing of the antero-medial cusp and then posteriorly to the external wing of the central cusp of the middle row. The central cusp of the middle row dominates the entire tooth, as in *P. laytoni,* the only other species of the genus for which this tooth is known. The anterior cusp of the middle row is a short transverse crescent. The cusps of the internal row decrease in size posteriorly and are subcrescentic.

On the basis of wear, right or left side, and number of specimens of types of teeth from three sub-localities, the 22 specimens at hand represent a minimum of six individuals.

The present species seems quite clearly to be derived from *Parectypodus laytoni* by way of the undefined species of *Parectypodus* from the early Eocene Four Mile fauna (McKenna, 1960, fig. 13b, UCMP 44010 and perhaps also UCMP 44009 and nine additional American Museum of Natural History specimens).

TABLE 1

		Length (mm.)	Width (mm.)	Cusp formula
M_1	CM 15126	1.45	.89	6:4
	CM 15129	1.58	.92	6:5
	CM 16982	—	.85	—
	CM 16983	1.63	.89	6:4
	UCM 28359	1.60	.92	6:4
M^1	CM 15084	—	1.16	?:?:6
	CM 15085	—	1.05	—
	CM 15133	—	1.07	—
	CM 16981	—	1.02	?:?:6
	UCM 25681	2.15	1.05	8:10:5
	UCM 28360	—	1.20	?:?:4+
M^2	CM 15054	.95	1.05	1:3:3
	CM 15086	.89	1.00	1:3:3
	UCM 25255	.92	1.00	1:3:3
	UCM 27094	1.00	1.05	1:3:3

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